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graph is scattered through several volumes, disconnected, and therefore less known and less valuable either to the state or to the general public. Nevertheless, the state geologist is to be congratulated on his selection of men to do this work and on the results obtained in so short a time, for it is unquestionably one of the very best reports made in this country upon building stones.

J. C. BRANNER.

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*The Ancient Volcanoes of Great Britain.* By SIR ARCHIBALD GEIKIE, F. R. S. Macmillan & Co., London and New York, 1897.

This work, as Sir Archibald Geike states in the introduction, is the outgrowth of his presidential addresses before the Geological Society of London in which he sketched the volcanic action in ancient times in Great Britain, whose record is left in the igneous rocks of several epochs from pre-Cambrian to Tertiary. No other part of the earth, so far as now known, presents within a comparatively small area such evidences of oft repeated volcanic action through so great a period of time. Commencing in pre-Cambrian times with three definitely localized volcanoes, the series is found to have extended through the Cambrian, Silurian, Devonian, Carboniferous, Permian and Tertiary times. The importance of the evidence furnished by so extensive a series of periods of volcanic activity as to the cause of volcanic action, and the source of the materials erupted must be apparent.

Its bearing on the question as to whether volcanic phenomena differed materially in the earlier periods of geological history from those of recent date, is also most valuable. And it is to be noted that the conclusion reached is that they are alike. The presentation of the facts known about these ancient volcanoes involves a description of rocks that were formed in various situations in the volcanoes; upon their surface, within their mass or within rocks beneath or about them; and which were subjected during the ages to processes that have modified their internal character and sometimes their external form. In order that these descriptions may be understood by the general reader the first chapters of the work are devoted to a consideration of general principles and methods of investigation. The nature and causes of volcanic action, and the phenomena connected with modern volcanoes are briefly noted. Considerable space is given to the characteristics of

ancient volcanoes, the nature of the material erupted, and the several types of volcanoes. Underground phases of volcanic action are also described; and the effects of subsequent denudation in exposing the rocks and their influence on the topography and scenery are discussed.

The major part of the work treats in detail of the volcanic phenomena connected with each period of activity, beginning with that in the pre-Cambrian time. Upon petrographical grounds the most ancient Lewisian gneiss, corresponding to what is often called Archæan, is considered to have been originally a mass of various eruptive rocks. Although they have been subjected to great mechanical deformation, the present banded structures are connected with the original igneous condition of the rocks. They were probably underground lavas, possibly connected with extrusive bodies. With these rocks are associated dikes of basic and acid rocks. Rocks of volcanic origin undoubtedly occur in the Dalradian schists of Scotland and in the gneisses and schists of Anglesey. The Uriconian, Malvern, and Charnwood Forest volcanic rocks are all of pre-Cambrian age. The volcanoes of Cambrian time occurred in South Wales, North Wales, Malvern Hills, and Warwickshire; those of Silurian time occurred in Wales, North of England and in Scotland, and Ireland; partly in the Lower, partly in the Upper Silurian. Volcanic activity was pronounced in Middle Devonian times but in certain districts extended into the Upper Devonian. In the period of the Old Red Sandstone there existed numerous centers of volcanic activity. In Lower Old Red Sandstone time they extended from Shetland to the Chevoit Hills in England and even to Lake Killarney, and from the coast of Berwickshire on the North Sea to near Lough Erne in the north of Ireland. They are less numerous in Upper Old Red Sandstone time, occurring in the southwest of Ireland and the north of Scotland. The Carboniferous age was marked by prolonged volcanic activity in Scotland and by restricted activity in England and Ireland. The volcanoes were partly of the plateau, partly of the puy type, accompanied, of course, by intrusive bodies. The Permian volcanoes of Scotland and England are much less important.

Four fifths of the second volume are devoted to the volcanoes of Tertiary time, for the reason that they are the most recent and their rocks are the freshest and most abundant. They occur along the west coast of Scotland and the northeast of Ireland. The dikes, plateau, and fragmental rocks are described in detail, and an account of the mod-

ern volcanoes of Iceland is introduced by way of illustration. The eruptive vents and the intrusive bodies, as sills and bases, both basic and acid, are also described.

The work closes with an account of the subsidences and dislocations of the plateaux and the effect of denudations. The final chapter consists of a brief summary together with the following general deductions: The distribution of the centers of volcanic activity has been along the western side of the country in a north and south line. The persistency of volcanic activity in this region and its restriction to particular localities are some of its most marked features. The sites of volcanic vents in Britain do not seem to have been determined by any obvious structures in the rocks now visible. Volcanic phenomena cannot be regarded as mere isolated and incidental features in the physics of the globe. They are intimately connected with profound terrestrial movements. They have been essentially uniform since the beginnings of geological time. In extent and rigor the earliest eruptions of which we have records did not differ in any important respect from those of the present time. However volcanic energy has not manifested itself uniformly throughout geological time. There have been periods of maximum and of minimum effectiveness. The character of the volcanic rocks and the general sequence of their eruption have been the same with slight modification for all the periods of activity in this region.

J. P. IDDINGS.

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*The Submerged Valleys of the Coast of California, U. S. A., and of Lower California, Mexico.* GEORGE DAVIDSON, A.M., PH.D., Sc.D. (Member of the National Academy of Sciences, etc.), Proc. Calif. Acad. Sci. Third Series, Geology, Vol. I, No. 2. With Nine Plates. San Francisco, 1897.

This paper gives a brief description of the Pacific coast from the southern extremity of Lower California to the Strait of Fuca. The general character of the coast, south of Cape Mendocino, is bold and rocky, reaching considerable elevations within a few miles of the shore. These coastal ranges are broken by valleys and plains of varying width which may or may not correspond to the submarine depressions described.

Bordering the coast from about Cape Mendocino southward there is generally a submarine platform, having an average width of ten miles,